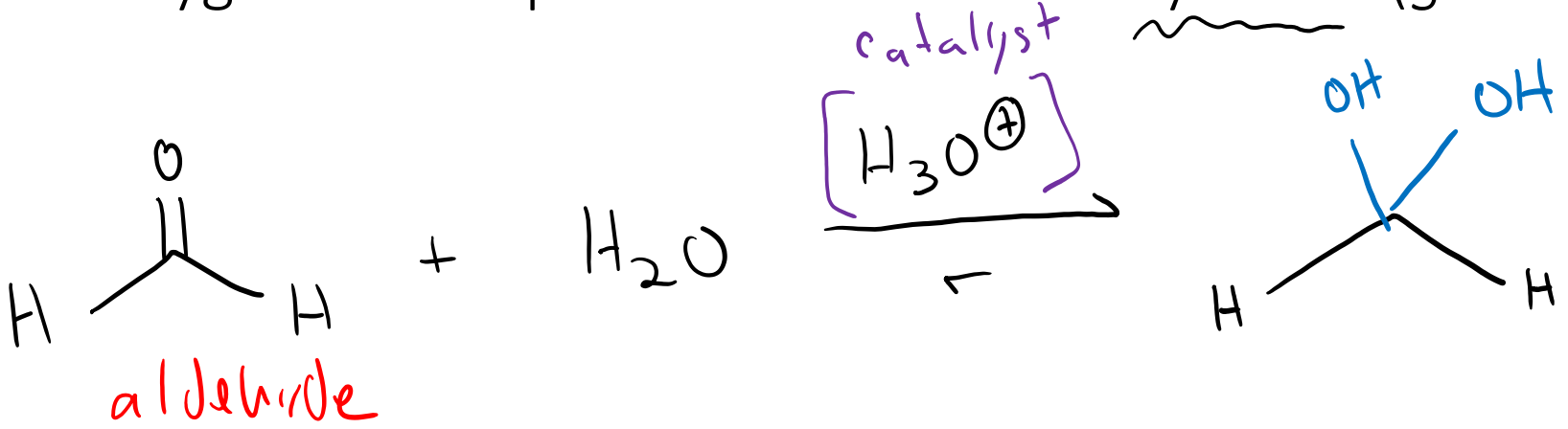
Aldehyde and Ketone Electrophiles

with

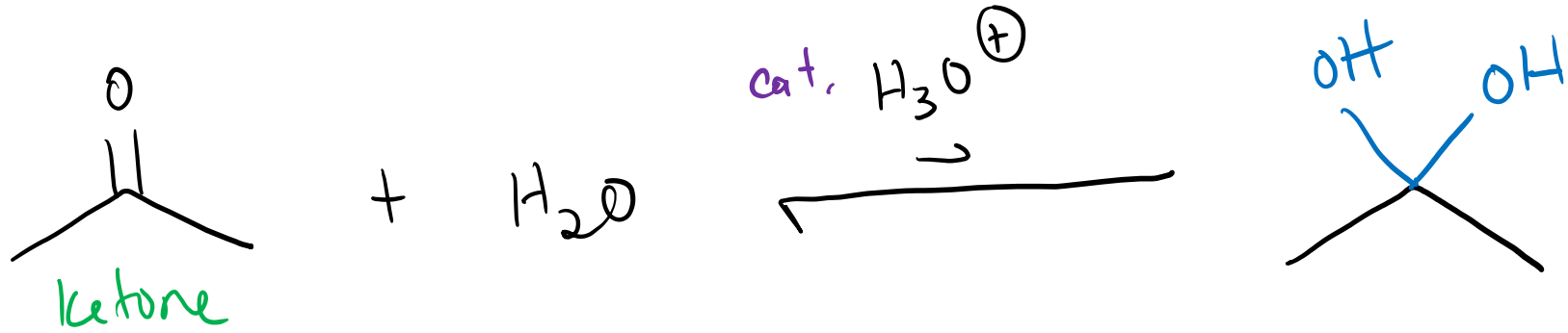
Oxygen and Nitrogen Nucleophiles

2/6/2023

Oxygen Nucleophiles: Formation of Hydrates (*gem*-diols) (19.5)

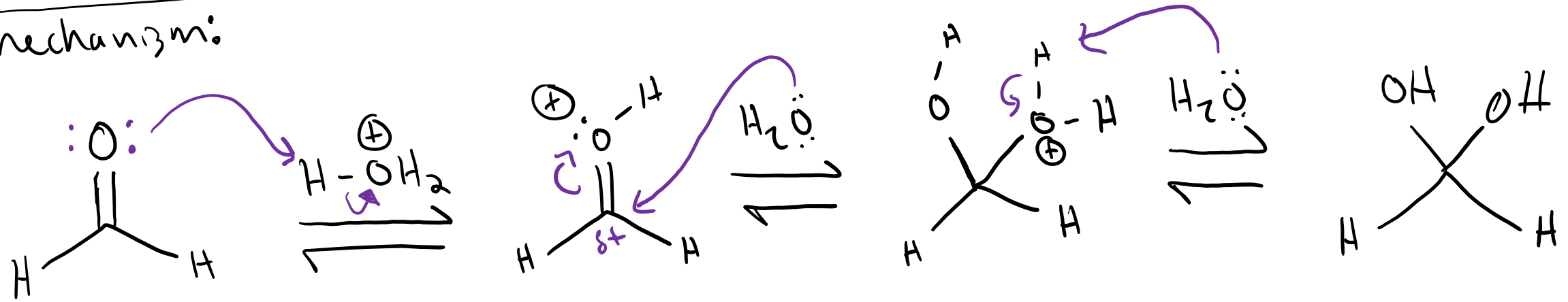


> 99% product @ equilibrium

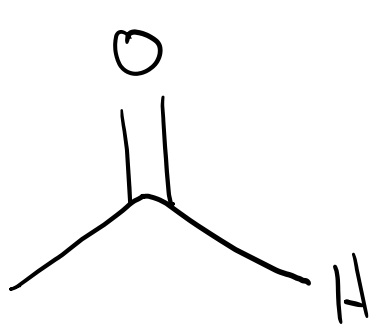


< 1% product equilibrium

mechanism:

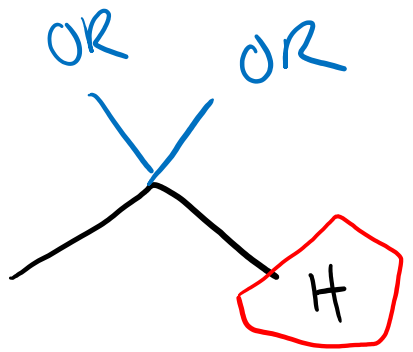


Oxygen Nucleophiles: Formation of Acetals (19.5)



aldehyde

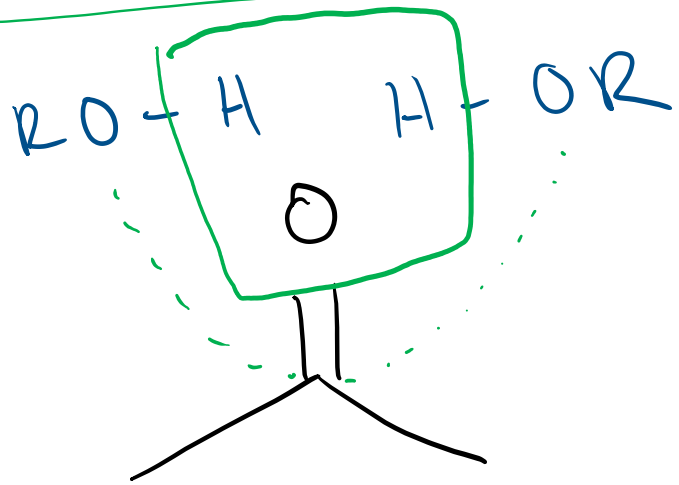
+ 2 ROH $\xrightarrow{[H_3O^+]}$



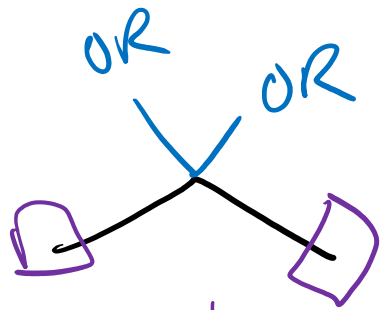
+ H_2O

acetal: C with 2 -OR groups

(emphasis goes on AL part @ end. acetal)

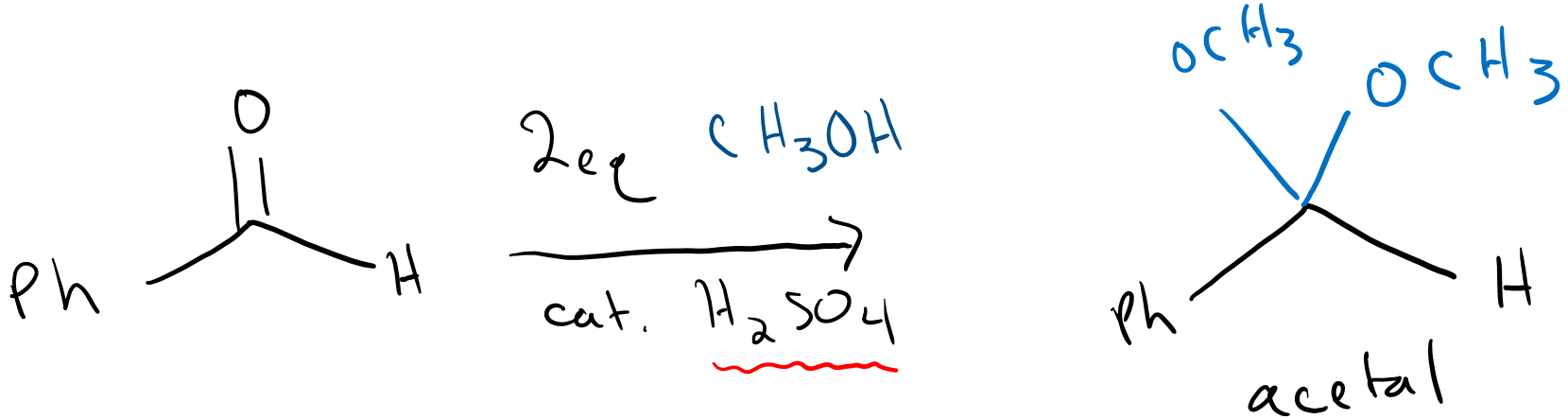


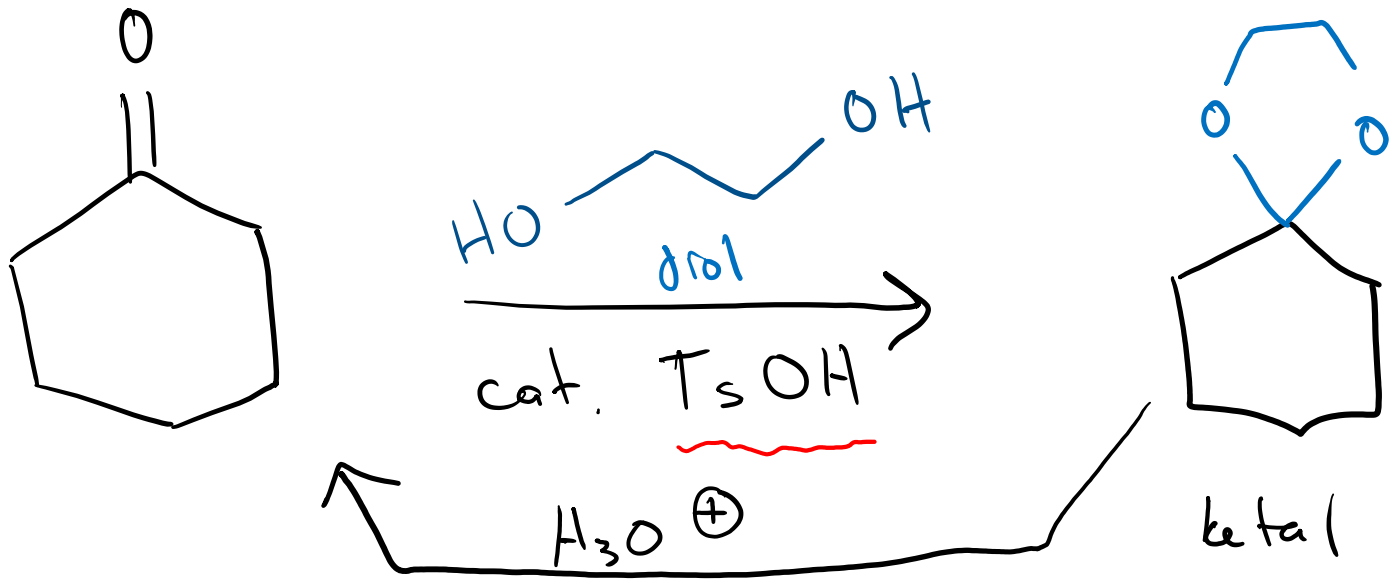
ketone



Ketal (special type of acetal derived from ketone)

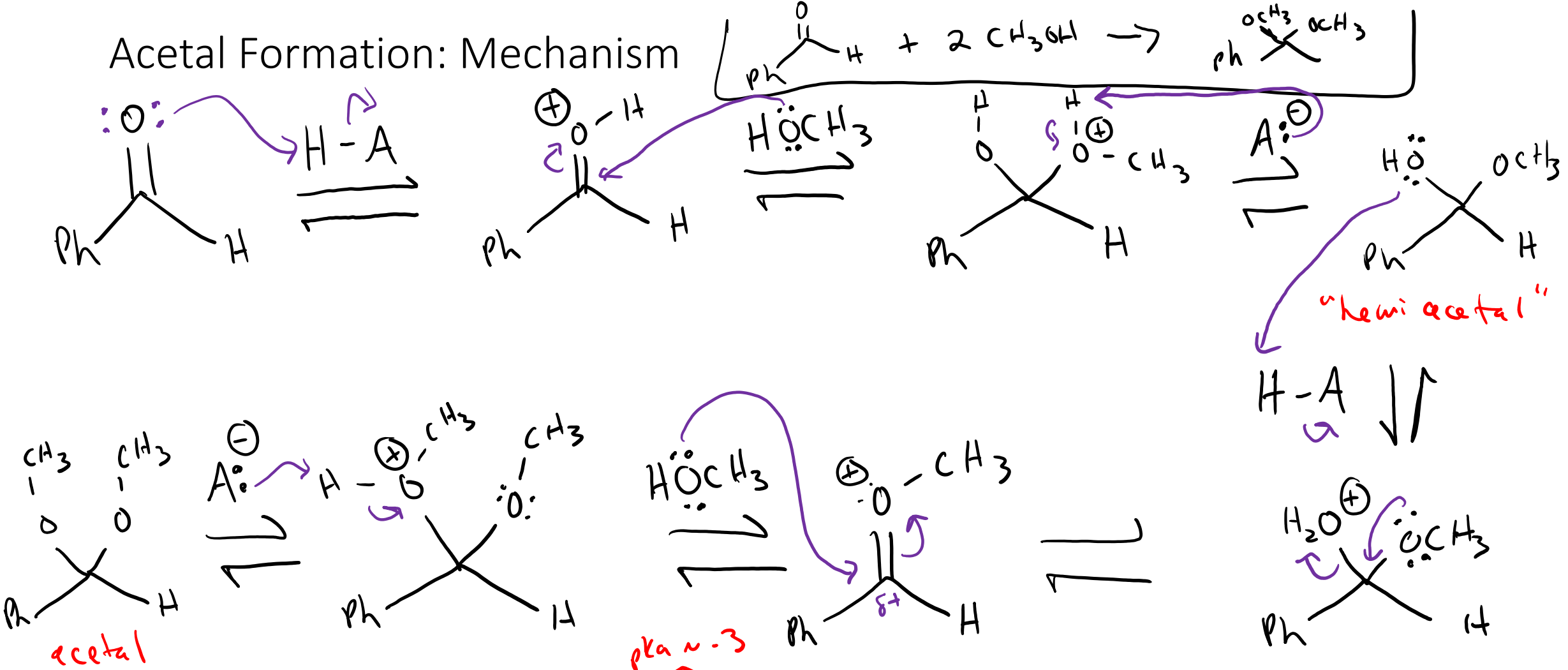
Oxygen Nucleophiles: Formation of Acetals (19.5)





useful reaction for "protecting"/reversibly blocking ketone/aldehyde.

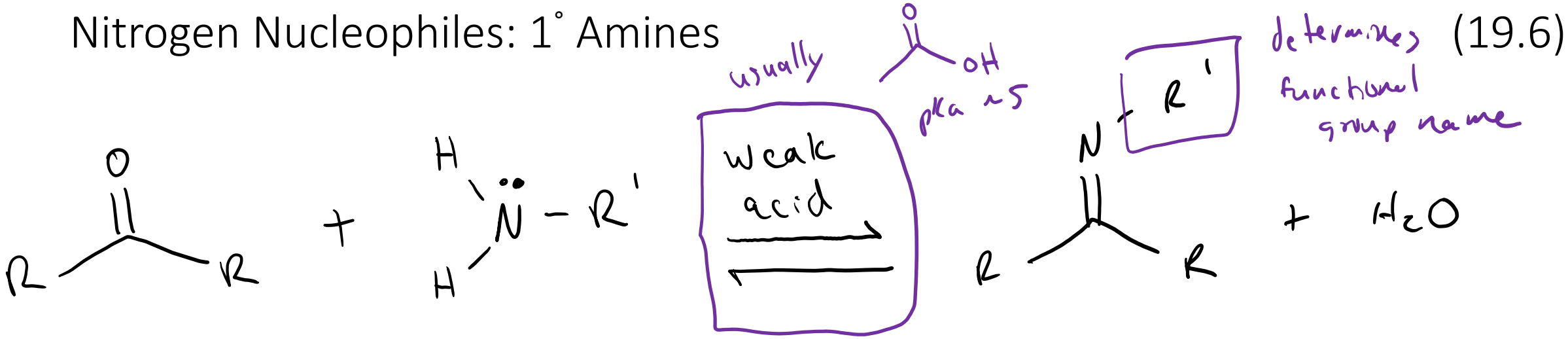
Acetal Formation: Mechanism



note: since we use H_2SO_4 or TsOH as acid catalyst, "HA" is most likely $CH_3\overset{\oplus}{O}H_2$, and "$A:^{\ominus}$" is CH_3OH.

★ I will accept "general acid/base notation as drawn above ★

Nitrogen Nucleophiles: 1° Amines (19.6)

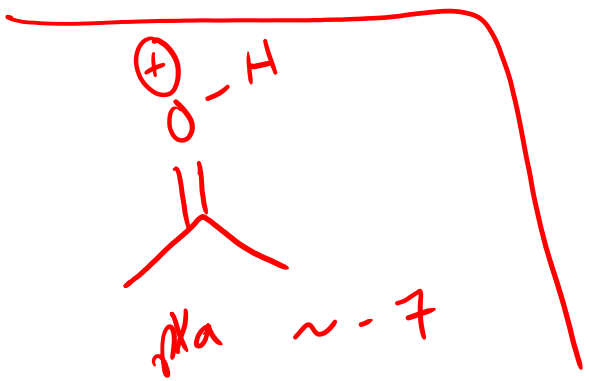


determines functional group name

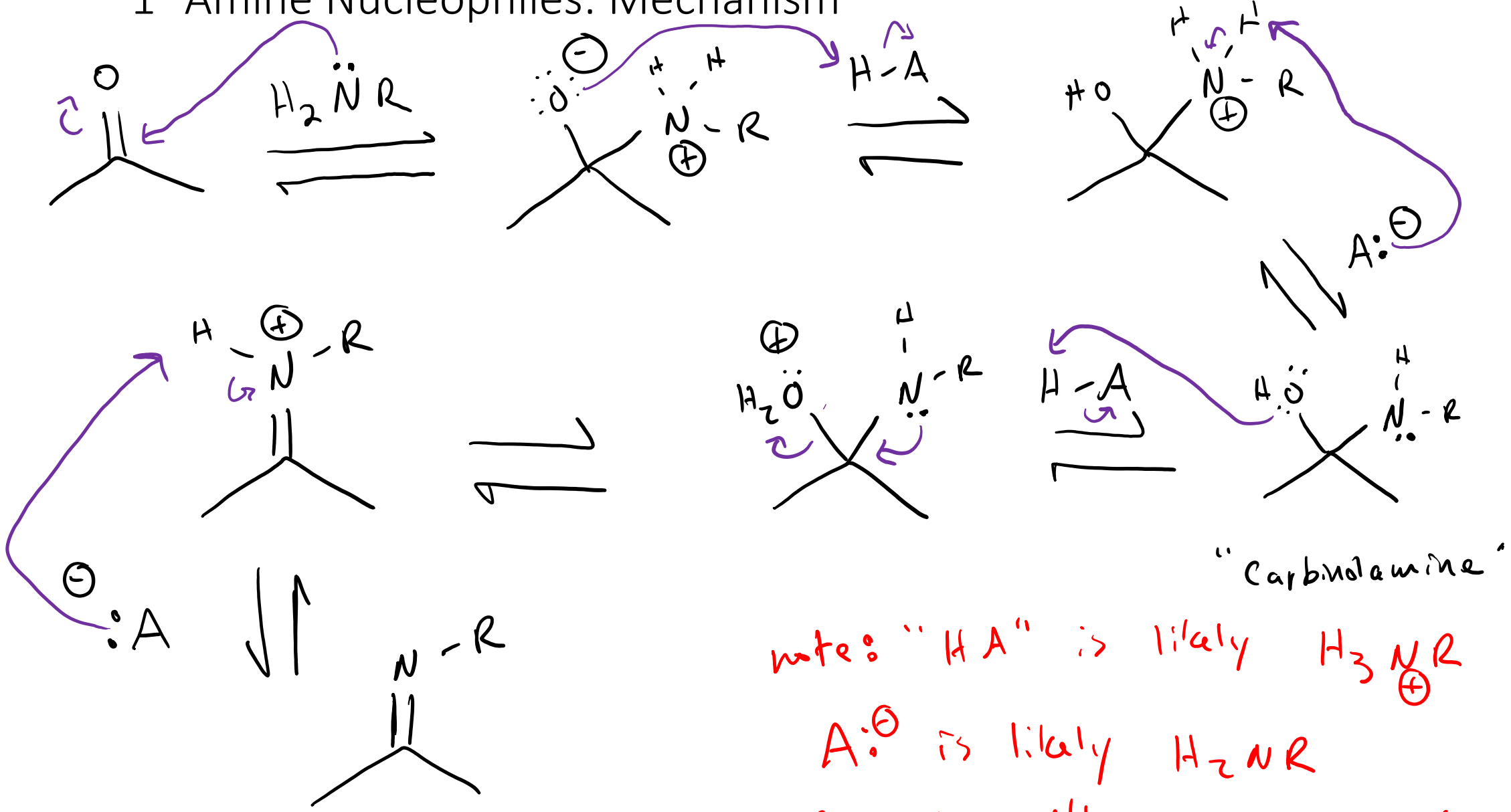
1° amine (1 R' group)

new functional groups just dropped!

R'	functional group name
alkyl	imine
–OH	oxime
–NR2	hydrazone



1° Amine Nucleophiles: Mechanism



note: "HA" is likely $H_3N^{\oplus}R$

$A:^{\ominus}$ is likely H_2NR

☆ General acid/base fine here too ☆

2° Amine Nucleophiles